IT’S ALL ABOUT THE DATA
PUTTING EPC/RFID TO WORK IMPROVING VISIBILITY
FROM A READ, WE GET…

- A string of hexadecimal characters, etc
  - Just the facts
  - Time & date stamp
TO HAVE A CONVERSATION YOU MUST SPEAK THE SAME LANGUAGE

Quoi??

Where’s my stuff??
VISIBILITY

KNOWING EXACTLY WHERE A GIVEN ASSET IS OR HAS BEEN AT ANY POINT IN TIME, AND WHY. (WHAT, WHEN, WHERE, WHY) MAY ALSO INCLUDE PHYSICAL CONDITION OF THE ASSET, PHYSICAL RELATIONSHIP TO OTHER ASSETS, OTHER INFORMATION
Government agencies consider Recall, Tracking, Tracing, and Pedigree all a part of "Traceability" — business processes.

- **Recall**
  - *Simple* = initiate a notification to bring it back
  - *Smarter*
    1. Find locations of product
    2. Initiate the recall
    3. Track the recall

- **Tracking**
  - "Where is my product now?"

- **Tracing**
  - "What is the history of where has my product has been?"

- **Pedigree**
  - Who has handled or had ownership of this product?

*Visibility data supports Traceability*
VISIBILITY INTO THE PHYSICAL WORLD

THE FOUNDATION OF “ACTIONABLE INTELLIGENCE”

• If you can’t see it, you can’t measure it

• If you can’t measure it, you can’t control it

• If you can’t control it, it’s probably costing you too much money…

• And you probably don’t even don’t know how much
ANSWERING A SIMPLE QUESTION…

• Where’s my stuff?
  • Did the right stuff in the right quantity get to the right place at the right time?
  • What condition is the stuff in? Is it scheduled for maintenance, refurbishment or retirement?
  • If something went missing, where was the last known place when we could see all the stuff?
  • Is it exactly the same stuff I saw last week?
  • Who had access to the stuff?

• Answering that question with objective data changes the conversation about items in the physical world
To answer questions about Recall, Tracking, Tracing, and Pedigree (business processes) you need VISIBILITY into supply chains (data).

In order to have VISIBILITY, it is essential to have……
STANDARDS – THE GS1 VISIBILITY FRAMEWORK

Company
- GS1 Company Prefix
- Global Location Number (GLN)
- Electronic Product Code (EPC) Manager Number

Product
- Global Trade Item Number (GTIN)
- Serialized Global Trade Item Number (SGTIN)

Inner Pack, Case, Pallet
- Global Trade Item Number (GTIN)
- Serial Shipping Container Code (SSCC)
- Serialized Global Trade Item Number (SGTIN)

Location
- Global Location Number (GLN)
- Serialized Global Trade Item Number (SGTIN)

Assets
- Global Individual Asset Identifier (GIAI)
- Global Returnable Asset Identifier (GRAI)
- Global Document Type Identifier (GDTI)

Services
- Global Service Relation Number (GSRN)
- Global Document Type Identifier (GDTI)

Electronic Product Code (EPC) RFID Encodings

Capture
GS1 System Data Carriers
Barcodes and EPC-enabled RFID tags

Share
Master Data
- Global Data Synchronization Network (GDSN)

Transactional Data
- Electronic Data Interchange (EDI)
- GS1 Business Message Standards (XML)

Physical Event Data
- EPC Information Services (EPCIS)
TODAY’S USE OF GS1 STANDARDS

- **Company**
  - GS1 Company Prefix
  - Global Location Number (GLN)
  - Electronic Product Code (EPC) Manager Number

- **Product**
  - Global Trade Item Number (GTIN)
  - Serialized Global Trade Item Number (SGTIN)

- **Inner Pack, Case, Pallet**
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  - Serial Shipping Container Code (SSCC)
  - Serialized Global Trade Item Number (SGTIN)

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  - Serialized Global Trade Item Number (SGTIN)

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  - Global Individual Asset Identifier (GIAI)
  - Global Returnable Asset Identifier (GRAI)
  - Global Document Type Identifier (GDTI)

- **Services**
  - Global Service Relation Number (GSRN)
  - Global Document Type Identifier (GDTI)

**Capture**

- **GS1 System Data Carriers**
  - Barcodes and EPC-enabled RFID tags
  - EAN/UPC
  - ITF-14
  - GS1-128
  - GS1 DataBar
  - GS1 DataMatrix

**Share**

- **Master Data**
  - Global Data Synchronization Network (GDSN)
- **Transactional Data**
  - Electronic Data Interchange (EDI)
  - GS1 Business Message Standards (XML)
- **Physical Event Data**
  - EPC Information Services (EPCIS)

**Electronic Product Code (EPC) RFID Encodings**

**Today’s Use of GS1 Standards**

- **Product Catalogs**
THREE KEY EPCGLOBAL STANDARDS

• Electronic Product Code (EPC)
  – Standard for encoding existing identification “schemes” (like GS1 keys) and user data in a common “envelope” for use with RFID devices
  – Standard for decoding identification and user data from RFID devices into human readable, Internet-ready format (URI) for use by information systems

• EPC Information Services (EPCIS)
  – Standard for the capture, storage and exchange of “visibility” events
  – Can be used with RFID and/or barcodes with serialized IDs

• Common Business Vocabulary
  – Defines the business process steps and disposition resulting from a read event
WHAT IS THE ELECTRONIC PRODUCT CODE?

Trade Item A
31234567 89012 000000123456

Trade Item A
31234567 89012 000000123459
WHAT IS EPCIS VISIBILITY DATA?

• EPCIS Data consists of events, each of which records something that happened in the real world.
• Often, though not necessarily, triggered by reading an RFID tag.

• An event has four dimensions:
  – What: what physical objects were involved (EPC or other identifier)
  – When: when the event took place (timestamp)
  – Where: where the event took place (location identifier)
  – Why: what business process step was being carried out
EPCIS EVENT IN XML

Event type

<eventTime>2007-11-06T15:00:02.449Z</eventTime>
<eventTimeZoneOffset>-05:00</eventTimeZoneOffset>

<epcList>
    <epc>urn:epc:id:sgtin:0614141.000001.2</epc>
</epcList>

<action>OBSERVE</action>
<bizStep>urn:epcglobal:cbv:bizstep:shipping</bizStep>

<readPoint><id>urn:epc:id:sgln:0614141.00300.0</id></readPoint>
<bizLocation><id>urn:epc:id:sgln:061414100300.0</id></bizLocation>

</ObjectEvent>

When
What
Why
Where
## EPCIS EVENTS IN TABULAR FORM

<table>
<thead>
<tr>
<th>EPC</th>
<th>Time</th>
<th>Biz Loc</th>
<th>Store</th>
<th>Sub loc</th>
<th>Biz Step</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10:12:03Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10:12:04Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11:12:03Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12:12:03Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

... ... ... ... ...

**What**

**When**

**Where**

**Why**
THE WHAT DIMENSION: THE EPC

• Looks like this:
  urn:epc:id:sgtin:0801234.099999.1732050807

• Tells you:
  – What product (GTIN / UPC)
  – What specific instance (serial number)

• What can also use other identifiers for:
  – Assets (GRAI, GIAI)
  – Documents (GDTI)
  – Services (GSRN)
THE WHAT DIMENSION: THE EPC

- Having a unique EPC for each product instance gives you new information.
- The specific instance (serial number) of a product lets you:
  - Measure transit time from the factory to the store sales floor
  - Know when a specific lot has reached the store
  - Know if exactly the same things you shipped were received
  - Learn how retailers cycle inventory
  - Trace history of a product as it moves through supply chain
  - Ensure that every single recalled product is returned
THE WHERE DIMENSION

- Each R# is a place where an event can occur

- Pack Line

- Ship Door

- Rcv Door

- Ship Door

- Rcv Door

- Back

- Front

- Store

- Trash Compactor

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THE WHERE DIMENSION

• The data contains a location identifier:
  urn:epc:id:sgln:0614141.12345.4153

• You can look this up in Master Data to get:
  – The type of site (DC, store, etc)
  – Which store, DC, or other facility
  – Area within facility (e.g. for a store: front room, back room, etc)
  – Sometimes even more precise information:
    • End cap vs shelf
    • Upper “steel” storage vs lower stock area (warehouse-style store)
    • Which department (grocery, sporting goods, etc)
    • Warehouse bin number
THE WHERE DIMENSION

• Having precise location gives you new information
  – When does product enter the sales area?
  – Was it stocked in the right part of the store?
  – At what storage location is a given lot being held?
  – How many products were brought to the dumpster?
  – Did the products show up at the right store?
  – Did they show up at all?
  – Where do I go to quickly find a missing asset?
THE WHY DIMENSION

• **Business Step**: what was happening to the object when the EPCIS event was generated?
  – Shipping
  – Receiving
  – Accepting
  – Stocking
  – + 27 others

• **Disposition**: what is true about the product afterwards?
  – In Transit
  – Sellable, not accessible (e.g., in back room)
  – Sellable, accessible
  – Non-sellable, expired
  – Sold
  – + 14 others
THE WHY DIMENSION

• Business Step and Disposition make it easy to process the data as part of a business process:
  – Can easily correlate to business processes (shipping, receiving, …)
  – No need to understand how the supply chain partner collected the data
  – Search and analysis simplified
EPCIS CAPTURE INTERFACE

TAG → READER → ALE → EPCIS CAPTURE → EPCIS CREATE EVENTS → EPCIS REPOSITORY

EPCIS CAPTURE INTERFACE

Object Event
15 Jun 16:10
EPC X
Store #23 Back
Receive
Sellable

TAG
READER
ALE
EPCIS CAPTURE
EPCIS CREATE EVENTS
EPCIS REPOSITORY

BAR CODE
HUMAN INPUT
INTERNAL APPLICATION

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EPCIS DATA SHARING

• How do you get data from across the supply chain?
  1. Capture your own EPCIS data
  2. Find other parties who also have data
  3. Exchange data point-to-point using EPCIS

• EPCIS is **not** a single giant database:
  Each party keeps its own data, and shares it only with whom it chooses
How do you find other parties who have data of interest?

Three options:

- Pre-arrangement
  - with your known trading partners
- Object Name Service (ONS)
  - finds the party that commissioned a given EPC
- Discovery Services
  - finds all data in the supply chain
  - still under development
TAKEAWAY – RFID ALONE ≠ VISIBILITY

- Visibility requires:
  - Common understanding of “atomic data”
    - What: Electronic Product Code (EPC) based on GS1 System
    - When: ISO Time/Date stamp
    - Where: Global Location Number
    - Why: EPCIS business vocabulary
  - Standardized interfaces from the tag/reader to the information system level
    - UHF Gen2 air interface protocol, low level reader protocol, reader management standard, filtering and collection standard (ALE)
    - Common language for capturing and sharing visibility “events”
      - EPC Information Services (EPCIS) Standard

- We need the GS1/EPCglobal Visibility Framework and Standards to enable visibility
- Visibility enables Traceability business processes
FOR GS1 PARTICIPANTS

Nothing changes…
• Still use GS1 Company Prefix to form GTIN, GLN

• Still use EDI messaging for order-to-cash choreography, including ASN

• Still use data pool, product catalog and/or GDSN to introduce descriptive information about new/changed products

…but everything can be enhanced
• We can use either barcode OR RFID to carry the identifier, plus a serial number for the “instance” of that identifier

• We can use RFID at the case level w/an “Aggregate” event to build detail into our ASN and associate distinct cases with a pallet

• We can use that data to confirm content of shipments by weight and measurements and to enhance our “shorthand” exchange of visibility messages

• We can use the EPC Information Services Standard (EPCIS) to “talk” with partners about visibility of physical things